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ABSTRACT

This study evaluates the relationship between college students' level of mathematics anxiety and the strategies they employ to cope with it. It also examines both counseling and mathematics faculty's ratings of the same coping strategies that the student subjects evaluated. Community college students (n=279) enrolled in either a remedial algebra or a non-remedial precalculus course completed the Composite Math Anxiety Scale (CMAS) and were asked to rate 10 mathematics anxiety coping strategies. Results show that students with low mathematics anxiety both utilize and value a wider variety of coping strategies than their high anxiety counterparts. There were significant gender differences for three of the coping strategies. This study demonstrates that approach strategies are regarded as the most helpful group of coping behavior and that low mathematics anxiety students tend to utilize and value coping strategies more than do high mathematics anxiety students. The paper includes the coping strategies survey for students. (KHR)

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Mathematics Anxiety and the Adult Student: An Analysis of Successful Coping Strategies

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A number of strategies designed to alleviate mathematics anxiety have been proposed (Hembree, 1990; Higbee, 1989; Robertson, 1991; Tobias, 1987). A partial list includes attending a mathematics tutoring clinic, keeping a "math autobiography," engaging in relaxation training, assertiveness training, stress inoculation, or systematic desensitization, learning to improve time management skills and study habits, and even adopting a "Math Anxiety Bill of Rights" (Davidson & Levitov, 1993; Hackworth, 1982; Tobias, 1991).

It has been suggested that just as mathematical problem solving has both a cognitive as well as an affective component (Bessant, 1995; Fennema, 1989; McLeod, 1988), so do intervention strategies designed to alleviate anxiety (Robertson, 1991; Williams, 1988). Cognitive (or math-dominated) interventions focus on the learning of mathematics content, assuming that the more mathematics students understand, the less anxious they will be, while affective interventions focus on psychological techniques such as peer support groups, counseling, and relaxation training that help students reduce their anxiety level.

The above list of coping strategies designed to help students alleviate mathematics anxiety has been presented in many formats, such as self-help manuals, diagnostic clinics, videotapes, pamphlets, handbooks, and seminars (Arem, 1993; Davidson & Levitov, 1993; Hackworth, 1982; Kogelman & Warren, 1978; Robertson, 1991; Sembrera & Hovis, 1993; Zaslavsky, 1994). Nonetheless, there is a lack of empirical research on student and faculty assessment of their comparative effectiveness. The present study examined this issue.

The primary purpose of this study was to evaluate the relationship between college students' level of mathematics anxiety and the strategies they employ to cope with it. Additionally, the study considered the effects of course enrollment, in either a remedial algebra course or a nonremedial precalculus course, and gender upon students' assessment of coping strategies. A secondary goal of the study was to examine both counseling and mathematics faculty's ratings of the same coping strategies that the student subjects evaluated. Aside from analyzing each group of faculty assessments individually, the study also compared these groups to the student ratings of the coping strategies.

Two-hundred seventy-nine community college students, enrolled in either a remedial algebra or a nonremedial precalculus course, completed the Composite Math Anxiety Scale (Tobias, 1993). This psychometric instrument, composed of twenty Likert type items, was adapted from the Fennema-Sherman Mathematics Attitude Scales (Fennema & Sherman, 1986) in order to provide an overall mathematics anxiety score. Afterwards, the students were asked to rate ten Likert type mathematics anxiety coping strategies, designed by the investigator, with regard to frequency of use and helpfulness. This set of coping strategies is presented in the Appendix. In addition to the student subjects, a total of fifty faculty members from the Mathematics and Student Development (Counseling) Departments at the same community college rated the set of coping strategies, but only in terms of faculty perception of helpfulness to students.

A multivariate analysis of variance (MANOVA) was performed on the student data. The three independent variables were Mathematics Anxiety level (high or low), Gender (male or female), and Course Enrollment (remedial or nonremedial). The dependent variables were the ten coping strategies, each of which was rated for frequency of use and helpfulness. In addition, the mean scores of the coping strategies (in terms of the helpfulness factor) were rank ordered and compared among the student, mathematics faculty, and counseling faculty groups.

A major finding of the study was that students with low mathematics anxiety both utilize and value a wider variety

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of coping strategies than their high anxiety counterparts. In fact, seven of the strategies (RELAXATION, DISCUSS STUDENTS, ASK QUESTIONS, HOMEWORK, REMIND YOU'RE GOOD, EXTRA STUDY TIME, and INSTRUCTOR KNOW), were preferred more by students with low mathematics anxiety than by those with high mathematics anxiety. Perhaps, because anxiety itself has a disabling effect on students, a low anxiety level may place students in an enhanced coping mode, thus empowering them to participate in the majority of coping strategies considered in the study.

It is also important to consider the types of coping strategies in which low vs. high mathematics anxiety students engaged. Namely, high mathematics anxiety students used tutoring services (TUTOR) and had discussions with their counselors (DISCUSS COUNSELOR) significantly more than low anxiety students. Both of these behaviors, which were the only two engaged in more frequently by high mathematics anxiety students, were considered among the least helpful by all of the students.

There were significant gender differences for three of the coping strategies. Practicing systematic relaxation, physical activities, or exercise (RELAXATION), an "avoidance" strategy which males utilized more than females, was considered one of the least helpful coping strategies by all students as well as by both groups of faculty. Alternatively, completing homework assignments on time so that you don't fall behind (HOMEWORK) and letting your instructor know if you don't understand the course material (INSTRUCTOR KNOW), two "approach" strategies which females found more helpful than did males, were both regarded as among the very most helpful coping strategies by all students as well as by both groups of faculty. A few significant differences were also found for course enrollment. Algebra students utilized certain strategies more than did precalculus students.

The three groups of subjects that participated in the study (mathematics students, mathematics faculty, and counseling faculty) essentially agreed on the helpfulness of the coping strategies, placing HOMEWORK, EXTRA STUDY TIME, ASK QUESTIONS, and INSTRUCTOR KNOW, all of which are "approach strategies" (since the individual directly confronts the stressor), in the top half of the list. This ranking is consistent with the work of Holahan & Moos (1987) who found such strategies to generally be the most successful category of coping behaviors as compared to "avoidance strategies" where the individual temporarily leaves the stressful situation in order to reduce anxiety.

Although the three groups of subjects fundamentally concurred in their ratings, some differences are noteworthy. First of all, both the counselors and mathematics instructors rated using a tutor (TUTOR) as more helpful but rated practicing systematic relaxation, physical activities, or exercise (RELAXATION) as far less helpful than did the students. The first difference possibly may be due to the fact that both groups of faculty can only perceive the tutoring experience from an outsider's point of view. The students themselves, who actually partake in the tutoring process, may not regard it as being valuable since they are more aware of both its advantages as well as its shortcomings. One possible example, although not specifically assessed in this study, may be that some tutors use different methods to explain course material than those used in class by the mathematics instructors. This dichotomous approach can be potentially disadvantageous.

In sum, as previous research suggests (Holahan & Moos, 1987), this study has demonstrated that approach strategies are regarded as the most helpful group of coping behaviors and that low mathematics anxiety students tend to utilize and value coping strategies more than do high mathematics anxiety students. A smaller number of coping strategies yielded significant differences with respect to gender and course enrollment, with females showing a tendency to utilize more coping strategies than males and algebra students more than precalculus students. In addition, mathematics students, mathematics faculty, and counseling faculty all essentially agreed when rating the coping strategies in terms of their helpfulness. All three groups regarded approach strategies as the most helpful. In particular, asking your instructor questions in class, completing homework assignments on time so that you don't fall behind, setting aside extra study time for review before class exams, and letting your instructor know if you don't understand the course material were valued the highest.

A number of pedagogic recommendations can be made based upon these findings. These include having mathematics faculty partake in training workshops that specifically focus on approach strategies as well as having peer tutors work together with instructors in the classroom so that students will ideally regard both of them as a "coordinated team." The author has successfully implemented both of these recommendations and will report the results in future work.

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APPENDIX

COPING STRATEGIES SURVEY FOR STUDENTS

MATH COURSE (CIRCLE ONE): ALGEBRA PRECALCULUS

SEX (CIRCLE ONE): MALE FEMALE

Directions: The following is a list of strategies that students may use in order to learn mathematics effectively and do well in their mathematics courses. Please respond to both questions listed below each of the following behaviors by circling **any** number from 1 to 5 where:

1 = not at all 3 = somewhat 5 = very much.

Once again, all responses will be kept confidential and used for research purposes only.

1. Using the school's tutoring center or a private tutor.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

2. Practicing systematic relaxation, physical activities, or exercise.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

3. Discussing experiences or difficulties related to your mathematics course with other students in your class.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

4. Discussing experiences or difficulties related to your mathematics course with your school counselor.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

5. Using additional textbooks or review books other than the required text.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

6. Asking your instructor mathematics questions in class.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

7. Completing homework assignments on time so that you don't fall behind.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

8. Reminding yourself that you are a good student if you start to feel incompetent.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

9. Setting aside extra study time for review before class exams.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

10. Letting your instructor know if you don't understand the course material.

   a. How often have you tried this? 1 2 3 4 5

   b. How helpful has it been
   OR how helpful do you think
   it would be if you tried it? 1 2 3 4 5

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